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A TENTATIVE METHODOLOGY FOR ACHIEVING COST REDUCTIONS IN PUBLIC CONSTRUCTION

A Working Paper Report

to the

AGENCY FOR
INTERNATIONAL DEVELOPMENT

OCTOBER 1973

Arthur D. Little, Inc.

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PREFACE

This is an interim report which we consider to be a working paper. Its purpose is to model the content of the final project report as far as this is practical on the basis of the results of the Colombia and Philippine phases. Its function is to elicit comment and suggestions on the contents for use in the next interim report, which is scheduled for preparation at the conclusion of the Ghana phase.

The work content anticipated in Ghana is outlined in a formal project statement issued on 4 July 1973. The program is scheduled for completion by 31 March 1974.

I. SUMMARY

A. PURPOSE AND SCOPE

The Agency for International Development (AID) is interested in assisting organizations in developing countries, who are concerned with civil engineering projects financed by local government agencies, to identify opportunities to reduce the cost of public construction. Moreover, this interest extends not only to the identification of opportunities for cost reductions in this sector, but also ultimately to the achievement of the benefits promised from their implementation. For this reason, the results from any assistance which AID grants in this respect should provide an impetus for developing countries to take the measures to achieve the desired benefits from cost reduction opportunities identified, with or without the further participation of external assistance agencies.

Accordingly, having such an interest in mind, AID requested Arthur D. Little, Inc. (ADL) to undertake a specific project for which the following goals were specified:

- to develop a methodology suitable for application in developing countries, which is aimed at identifying cost-reduction opportunities based on the construction of public works; and

- to assure the practicability of implementing the results of the application of the methodology, by testing its elements in the course of specific projects to be carried out in three host countries to be selected by AID. (Ultimately, the selection was Colombia, the Philippines, and Ghana, and work was to be undertaken in that order.)

While accomplishing these goals, ADL was to emphasize not only the technical aspects of identifying cost-reduction opportunities, but also the identification of the institutional and social barriers to the acceptance of the results which may exist within each of the three countries.

The scope of activities initially foreseen in order to attain the project goals in each host country was partially oriented to identifying cost reductions through increased use of indigenous materials. The original scope accordingly included the following:

1. Identify, formualte, and carry out materials research and adaptation projects which will reduce short-term costs and long-term drains on national budgets.

2. Focus on locally-available materials, or those which are the least expensive to import, yet yield a high efficiency in performance.

3. Make a current assessment of the state of construction materials technology and research opportunities.

4. Upgrade the ability of counterparts to analyze not only the technical problems but also the institutional and social barriers to the utilization of improved materials.

5. Develop a technical basis and provide an impetus for:

   a. undertaking the most appropriate materials projects;
   b. improving the capabilities of local engineers and institutions in the analysis, testing, research, and innovation aspects of materials technology; and
   c. encouraging both government and private industry to adopt the concepts of cost reduction and value engineering.

6. Clarify the types of adaptive research and other action programs offering the most promise of making a significant impact in the field of materials technology.

Later, during the course of the work, AID increased the scope of ADL activities to include conducting a seminar in Washington D.C., after the conclusion of the work in the third country, during which the accumulated results of the work would be presented, discussed, and evaluated by specifically selected and invited participants, including representatives from the three host countries.

B. METHOD OF APPROACH

We adopted and are using a method of approach which has two distinct aspects. The first aspect is to keep in mind a fixed set of principles which we may expect will not change throughout the course of our work, and which accordingly will be reflected in the methodology we ultimately recommend. The fixed set of principles is the following:

- work within the structure which we may find has already been set up in each host country for the administration of the cost-reduction project;

- concentrate our assistance on the organizations in the host countries which are concerned with the execution of civil engineering projects financed with public funds through local government agencies;

- focus on those areas of construction activities for the detection of the cost reduction opportunities that promise maximum benefits from reducing costs, from improving balance of payments, and from showing a good potential to overcome institutional impediments to accepting and accommodating change;

- include efforts not only to identify technological opportunities, but also to identify techniques to penetrate the industrial sector with improved technology; and

- assist institutions in the host countries to clarify gaps and weaknesses in their operations, to identify priorities for attention, and to formulate action plans.

The second aspect is to recognize that some initial concept of a methodology should be tentatively adopted before work begins in the first host country. The concept should be a flexible one which can be easily amended as experiences accumulate from the work in the three host countries and ultimately from the results of the Washington conference/seminar.

Accordingly, we began the work for the Colombia phase with a tentative concept for the methodology which had the following elements.

1. Detailed Project Planning. Provide beforehand a background for the work by undertaking a program of literature research, consultation with knowledgeable people, and identification of technical organizations in the host country.

2. Reconnaissance. Reconnoitre before detailed work begins by travelling to the host country for the purpose of establishing the administrative base for the project, identifying sources of information, selecting counterpart personnel, and establishing the general project schedule.

3. Information Gathering and Evaluation. At the appropriate time participate in undertaking the concerted work effort, which is to collect the information and data that will enable the counterpart personnel to assess the current state of materials technology for public works in accordance with the scope of the activities. The papers to be prepared as the result are basically to be informational and related to the demand, supply, and conversion aspects of materials.

4. Analysis and Conference Planning. Assist in planning for a conference/seminar by participating with the counterpart personnel to identify opportunities appropriate to the goals of the project, to formulate corrective programs, and to organize an effective conference/seminar. The aim of the conference/seminar is to present the action plans for achieving the benefits of the cost-reduction opportunities, and to assess the practicality of their implementation by providing a forum for the organizations affected to state their views and reactions.

5. Project Review and Report Preparation. Assist in preparing for the conference/seminar through providing the counterparts with an opportunity for ADL home-office work in which the papers prepared will be reviewed by an impartial group of ADL staff to ascertain whether the action plans formulated are complete and defensible. The results are to be revised papers ready for distribution in a formal conference.

6. Conference Activity. Assist in conducting the conference/seminar through evaluating the viewpoints in the discussions of the participants and the replies during question periods, and feeding back the results in the formulation of the final action plans.

7. Host-Country Report. Assisting the counterpart organization to prepare the final report of the work in which the recommendations will contain the action plans which promise the achievement of the benefits of the cost-reduction opportunities identified during the work.

8. Follow-Up. Undertaking a visit to the host country at some appreciable long time after completion of the work in that country to determine the actual implementation efforts undertaken for the final action plans.

C. CURRENT OBSERVATIONS

1. State of The Work

At the present time (October 1973), the Colombia and the Philippine phases of our work are completed, excepting only the follow-up visit to each country. The Ghana phase is in the early stages with completion planned for 31 March 1974; and the Washington conference/seminar is about a year away (September 1974). Nevertheless, the results accumulated so far permit a number of observations to be made at this time, which appear likely to affect the final result of our work, that is, the recommendation of a methodology for identifying opportunities to reduce costs in public construction.

2. Distinction between Methodology and Technology

Both methodology and technology should be applied to efforts to achieve benefits through the reduction of costs in public construction. These two concepts are fundmentally different, and a clear distinction between the two is necessary. Otherwise, their application to an

actual set of construction activities may not be effective. In order to distinguish between the two, some element of arbitrariness is necessary for the reason that different investigators can offer different and logical views on where the boundary between methodology and technology actually lies. Thus, establishing a universal agreement as to the nature of the boundary may be a subjective matter.

A reasonable distinction between methodology and technology is practical at this time and should be adopted for our works. This limits technology to a concern with the definition of the possible, i.e., with the definition of technically-feasible cost reduction opportunities: it limits methodology to a concern with the speed at which such feasible opportunities can be achieved in fact, i.e., to a concern that man-made institutions, subject to political and sociological forces, are involved in the achievement and may hold well-defined and strong views on their acceptability. Thus, technology addresses itself to such factors as the pattern of use of materials of construction, their fabrication, and to technical installation and erection practices involved in public construction; while methodology addresses itself to the character of the institutions and to the practices they employ in order to accomplish all efforts involved in public construction, e.g., letting of contracts, adoption of standards, and providing finance.

3. Types of Cost-Reduction Opportunities

Two types of cost reduction opportunities should be distinguished. The first results from the application of technology and hence is technical. This type of opportunity arises from combinations of changes in technical practice such as reductions in the quantities of materials consumed, substitution of less-costly alternative materials of equivalent performance, and reductions in labor consumption and

services of capital equipment in a set of construction activities. At the same time, such changes assure that, as a result, the quality of the performance of the final installation is unaffected.

The second type of cost reduction opportunity results from the application of methodology and hence is institutional. This type of opportunity arises because of reduction, for example, in the quantities of labor and of services of capital equipment needed to manage the set of construction activities, i.e., because of a reduction in the "overhead" cost. Another example may be the adoption of a set of standards to reduce the variety of materials and construction techniques in common use.

4. Concepts of Cost Reduction.

The definition of cost should be broader than its conventional meaning, which is that of a financial (or market) costs. The definition should be broadened to reflect the implications of the effects of a proposal cost reduction on the foreign-exchange demand or on the generation of employment opportunities for labor. A cost reduction in the financial sense is primarily suited to the profit-oriented enterprise engaged in public-construction activities.

For a potential reduction in public-construction cost to be meaningful through beneficial impact on a national economy, the evaluation of a potential cost reduction should include its "shadow" effects on the economy, i.e., a change in a set of public-construction practices should be evaluated by computing national economic costs, as well as financial costs. Thus, it is possible that opportunities may be identified in which financial costs are decreased but at the same time national economic costs are increased; or, the reverse may be identified.

Furthermore, any cost-reduction opportunity, regardless of whether it is financial or national economic, should be measured by its effect on a balance between the short-term and long-term costs of a project, i.e., the ultimate costs of a construction project in present-value terms influences the decision as to whether a particular change in technological practices actually represents a cost reduction.

5. Focus on Appropriate Technology.

The original primary focus for the work, i.e., an emphasis on the increased use of indigenous materials as the means for reducing costs in public construction, should be reconsidered so that a co-equal focus on the increased use of appropriate technologies as the means to reduce costs in public construction will also exist.

Although the preferential use of indigenous materials in public construction directly, or indirectly through their use as raw materials in manufacturing industries, is a prime area to explore for cost reduction opportunities, the experiences so far in Colombia and in the Philippines, and also the indications for the Ghana phase, show that such uses have already been quickly identified and implemented. Thus, if the work were to be limited to this area, it could turn out to be unproductive.

On the other hand, a strong local desire prevailed in all three host countries to increase labor employment opportunities in the public construction sector. In Colombia, the desire reflected as an appropriate use of labor in the construction of urban multi-family dwellings. In the Philippines, labor employment in road-construction activities was the predominant one. In Ghana, the counterpart organization selected labor employment as one of the five topics to be investigated. Moreover, in all three countries, we found it important to identify changes

which can reduce demands on foreign exchange, such as would be generated by decreasing imports of construction machinery and spare parts.

Ideally, the most responsive approach to labor-employment and foreign exchange desires seems to lie in identifying the appropriate technology for a given construction task as that technology which results in the least national economic cost for accomplishing the task. Practically, the responsive approach seems to be to identify technologies for a set of construction activities which are more appropraite than the technologies currently employed.

6. Development of a Methodology.

Two methodologies are ultimately to be developed, although the scope of our present work emphasizes only the first. The first methodology deals with the aspects of identifying opportunities for cost reductions in public construction, while the second deals with aspects of implementing them. As should be expected, the experiences so far indicate that different sets of institutional practices are to be dealt with in the development of each of the two methodologies.

The elements originally contemplated for the work covered primarily the development of the identification methodology. The follow-up element in our work plan is aimed at beginning the development of an implementation methodology. The set of recommendations (the implementation steps in the action plans) in the host-country report resulting from the application of the identification methodology should be the basic input for the application of an implementation methodology.

A PROPOSED REINFORCEMENT TO AN OBVIOUSLY SUCCESSFUL PROGRAM

I would be the last to subject changes to a program which in some cases has proved successful while in other cases needs testing.

Additions should be made to enhance the chances of improvement which do not include any changes in the present program.

This supplement is based on the involvement of people in supporting the program which has been implemented in a number of provinces in the Republic of the Philippines. It does not propose changes in any way -- only support by the people.

I have suggested no changes in my paper "The Simultaneous Modernization of a Nation Socially, Economically, Politically and Attitudinally".

There seems to be one and one only problem which has surfaced, identified and implemented by local level people along with local private enterprise, that being supervised credit to the small farmer.

Since supervised credit or credit to the little farmer becomes involved in many aspects, it has a tendency to activate other interests but of a desirable magnitude of involving thousands of people to implement many ways of improved life and living.

To develop a modernized, well balanced program for any country all phases of development must be fully scrutinized and considered:

1. Social
2. Economic
3. Political
4. Attitudes.

The gaps on each of the above must be closed between local and central governments. Until this is done, little else will be accomplished.

A Simple Procedure to a Difficult Problem

1. Simple learning by villagers to identify their own problems.

Step No. I - Provincial Seminars

Several different approaches can be tried regarding personnel and procedures. This must be worked out to perfection.

A meeting of the Governor, Vice-Governor, Provincial Council and Provincial Technicians from all Secretariats.

The purpose of the meeting explained by the AID advisor or better yet by a counterpart at central level.

A likely prospect would be a representative from the Secretary of Agriculture.

The purpose would consist of a prepared paper on people involvement in the support of projects involving social, economic and political movements through common interest groups at local level.

This meeting has the sole purpose of obtaining the sanction of the government and the staff at provincial level.

Step No. II - Municipality Seminars

Provincial sponsored seminars conducted at municipality level to explain the purpose and the procedure.

Those participating:

A representative of the Secretary of Agriculture (appropriate designee), a representative from the Governor's office, the Mayor and staff including technicians.

a. Purpose of the meeting by the Provincial Representative

b. An outlined fact finding form is presented to the group for discussion. (This is the first step in a learning process.)

c. Each topic in the fact finding form is discussed for informational purposes.

It should be explained to the municipality group that the fact finding survey will be used in every barrio to each family.

Step No. III - Barrio Seminar

A barrio level meeting will be called by the Mayor of the Municipality.

Those present:

A representative of the municipality, barrio captain and every adult in the barrio, farmer, businessman or otherwise.

An outlined fact finding form is presented to the group by a trained technician for discussion.

Allow the group an opportunity to accept or reject the conducting of a fact finding survey.

Step No. IV

Each barrio member is asked to complete the questionnaire for the sake of a record. The barrio captain requests volunteers to gather the data house-to-house.

Personnel assisting in the survey:

This is accomplished by literate volunteers attending the seminar to select a given number of households to collect information. These people should be citizens and not government servants.

Step No. V

After a 10-day period each member of the barrio collection team will submit the reports for tabulation. The recapitulation will be accomplished through participation of all the fact collection team.

Barrio chief and all literate people interested in learning to develop their community - usually the number will consist of five people up.

Importance of the Survey

a. The farmer is being invited to participate in something new.

b. The farmer is not ignored but is included in the development of his own local program.

c. He is particularly in the most effective learning process yet conceived.

d. He realizes many things about himself, his family, his barrio and his country after the exercise that he did not realize before.

e. It is a reminder that he should accomplish many things he has ignored before.

f. He has facts and statistics to prove to his govermment on demands that he could not use as fortification and arguments he did not possess before.

g. It instills in the average local citizen that he must be a participant in the development of many projects not yet realized by him.

Step No. VI

Third barrio meeting called by the barrio captain to review the recapitulation of all the survey forms.

Attendance: All interested parties within the barrio.

Results of the survey discussed openly in the meeting led by the barrio captain or his designee.

The problems of the barrio are set up in the order of their importance in the judgement of the farmers and other members of the barrio.

This is perhaps the most important step in the beginning of objective thinking by the right people which are the local people.

In one barrio the problems confronting the people might well look like this:

1. Size of family very large

2. Size of farm too small for a feasible economic unit, yields low, etc.

3. Lessees too few, movement from share cropper too slow

4. Irrigation hectarage too small, more multiple cropping needed

5. Livestock feeds too costly, baby chicks loss very high, too many hogs die of contagious diseases, etc.

6. Credit sources need to be increased, cost of production in excess of credit allowance

7. Income per family too low, etc.

8. Many babies die previously to one year of age. Common diseases rage uncontrolled at times.

9. More side roads needed, cost of marketing excessive because of lack of roads. Transportation facilities inadequate.

10. Excessive loss from insects and rodents.

11. Improper planting time causes excessive destruction of crop from storms.

Examples of contents of the survey for discussion by all present: (This discussion is merely to orient participants of the knowledge each should possess.)

1. Population, rural and urban, number of farmers, businessmen, age of farmers, school-aged children, boys and girls, number of voters, etc. (Problem concerning population)

2. Agricultural production - acreages of all crops, yields, rainfed and irrigation

3. Land Reform situation - number of owner-operators, number of lessees, number of share tenants; hectares in production; potential hectarage; waste land.

4. Irrigation situation - number of irrigated hectares; number of hectares potentially for irrigation; costs of irrigation of various types.

5. Condition and numbers of livestock and poultry

6. Inland fisheries situation

7. Credit and finance - income per family; sources; adequacy

8. Health and sanitation

9. Communications - roads, telephones, telegraph and how it curtails cropping and marketing

10. Plant protection - losses, insects, diseases, and rats

11. Losses through natural calamities

12. Education - school-going children and children of school age; adult literacy

13. Housing

14. Small and cottage industries

15. Community organizations and recreation

16. Only 40% of school-aged children attending school

17. Housing facilities must be improved to prevent sickness

18. This barrio has no income other than small farms and small merchants. Supplemental income through other sources must be developed to increase the sub-marginal incomes.

19. No organizations such as PTAs, boy scouts, livestock and crops improvement clubs for youth are absent.

These are problems and not solutions and they will differ in every municipality if not in every barrio within the municipality.

Step No. VII

Third Barrio Meeting - Setting up Problem Sub-Committees. These sub-committees may go by any name.

These people may be selected from leading farmers who are interested in some particular phase of agriculture or rural living. The sub-committee might consist of the following:

Chairman - preferably an active barrio citizen

Members - might consist of two or more and should be popular leaders and successful in the particular project of their activity.

These members are then given instructions of working directly with technicians of the various departments and divisions in satisfying their needs.

They might begin the formation similar to the example listed below:

1. Crops Sub-Committee:

   a. Chairman

   b. Members

   (There might be a greater number of sub-committees as time progresses.)

Problems:

1. Area of crop land too small under present conditions especially with the average family of 7 people. Yields of palay far below what can be produced.

2. Less than one percent of all cultivators need credit yet 80% say they need credit. Crop loans have been too small in the past.

3. Storms damage crops almost annually because no effort is made in timing plantings to avoid general storm season.

4. More hectares need to be placed under irrigation.

5. Inability to produce secondary crops because irrigation has not been developed nor has mechanization been introduced due to lack of financing.

Departments and technical services responsible for aiding sub-committees in solving problems:

1. Agriculture

2. Banking interests

3. Cooperatives

4. Private sector, fertilizer, chemicals, machinery.

Duties of Crops Sub-Committee:

1. To keep in touch with all departments and sectors responsible for aiding the farmer, public and private sectors.

2. Select good cultivators to carry on demonstrations.

3. Make regular visits to demonstration plots.

4. Call and conduct demonstration meetings in various parts of the barrio.

5. Make a study of new crops and varieties to be tested.

6. Contact barrio farmers and villagers asking their needs.

7. Keep record of the proceedings and minutes held with the service staff.

8. Study a practical cropping system for the village.

9. Check the need of plant protection at all times and use preventative plant protection.

10. Study costs of production records.

11. Organize regular seminars and training schools using technicians as teachers.

12. Conduct crop demonstrations and field days.

13. Coordinate closely with other sub-committees in setting up a good credit program.

14. Act as a control board in making agricultural loans as well as investigations and collections.

The formation and duties of each sub-committee which might range from a few to many, depending on the results of the survey would probably follow a similar form to the preceding one described.

In the event barrios are small in population, several might be combined.

It may be seen that all common interest groups (sub-committees arising from surfaced problems) have a definite set of duties.

As sub-committees become active they grow in membership.

Other sub-committees which might be created either in the beginning or later might include the following:

1. Land Reform Sub-Committee
2. Credit and Finance
3. Irrigation Sub-committee
4. Animal Husbandry
5. Public Works
6. Horticulture or Fruits
7. Fisheries
8. Education
9. Homemaking
10. Communications
11. Health and Sanitation
12. Marketing
13. Small Industries
14. Recreation.

Each sub-committee should meet at least semi-monthly. Each sub-committee should use as a nucleus the barrio council which becomes an integral part of the development. Barrio sub-committees

and central committees both barrio and municipal have thought to request the services of all government agencies and technicians.

Municipality Representation

With the mayor as chairman and his council as the nucleus, each barrio will have one member representation other than the present captain or council to represent this barrio at a regular monthly meeting.

Barrio decisions project proposals will be passed on to the municipality which in turn will, after due action, be passed to the province.

Evaluations and progress reports are done by each sub-committee semi-annually.

This procedure is very simple, very flexible, very compatible and does not change the present procedure but definitely fortifies the present program.

Politically if a province has 5000 barrios with 5 sub-committees per barrio each having 10 members, the governor has 250,000 supporters as do the mayors all of whom are at work on wholesome projects.

Socially more people are collaborating on common interests than ever before.

Economically 250,000 people are supporting their province at no additional cost to the government. They are capable of generating enough funds (bamboo money), investments from private enterprise and private loan money to create a provincial revolving fund of ₱100 per

person or ₱25,000,000 additional funds for all uses which has not been donated by the Philippine Government.

This exercise is only possible when attitudes of the right people are healthy - these are the local people.

This suggested approach may be changed to meet existing conditions nationally or locally according to existing conditions and results evaluations during development.

* * *

BRFerguson:lcv
AD/AD:July, 1972

The results of the work so far permit the following observations with regard to the development of an identification methodology:

- The methodology will ultimately be applied within a framework one of whose elements is the presumption that a foreign organization will participate to assist technically the efforts of a local counterpart group for each group the methodology is intended; and another of whose elements is the constraint that local goals and aspirations will place on the selection of the topics to be investigated.

- Ideally, the counterpart organization will be a task force of counterpart personnel qualified to undertake the work. A leader should be identified for each topic who will work full time and seek assistance as required on a full or part time basis from others. The project leader, the task-force leader, should report to a steering committee chosen with a view of achieving acceptance and implementation of the results of the work. The task force should have the physical support of office space and transport, and a budget if the administrative practice of the host-country government permits.

- The reconnaissance should be the first work activity, with the goal of establishing a project statement describing the work to be undertaken and the environment in the host country in which it will be accomplished. Ideally, the identification of the counterpart organization and the counterparts should be part of the reconnaissance work program, but whether this will be practical depends on the internal situation in the particular host country.

- An intermission, during which work activities will begin, is desirable, and probably practical to arrange in all host countries. Only the duration of the intermission might vary among the potential countries in which the project could function.

- The desirable procedure will be for the technical-assistance organization to be continuously present during the collection of the data, their evaluation, and the preparation of written results. The end result of this work should be the mounting of a conference/seminar designed to obtain a feedback of opinion and comment from an audience, or set of participants, representative of all organizations and institutions in the host country, which in some manner will be affected by the results. This feedback should be an important input to the formulation of action plans.

- Immediately upon completion of the conference, conclusions and action plans should be formulated, and the final host-country report prepared. The end result should be an oral presentation of findings to the steering committee along with the presentation of the final report.

The results of the work so far do not yet warrant making observations concerned with the development of an implementation methodology.

II. INTRODUCTION

The ultimate goal of the project is to establish a tested methodology, which can then be applied in developing countries in order to achieve reductions in the cost of construction of public works. The benefits in general of such an achievement are obvious. Developing countries usually have a scarcity of resources to meet their needs; and one need, the public construction of new infrastructure facilities, is usually the most important and significant demand on resources. Reductions in the cost of public construction can serve to stretch resources to help cover all the demands on them. The rate of progress in economic development could then accelerate.

Current progress toward establishing and testing such a methodology is occurring in three host countries: Colombia in South America; the Philippines in Asia; and Ghana in Africa. The work is most advanced, and about at the same stage, in Colombia and the Philippines. It is at an early stage in Ghana.

So far, in all three host countries, we have found that our work efforts should be based on work topics where the potential results will be responsive to current national goals. Moreover, our experiences show that the nature of the host-country organization has varied in each case, as has the selection of work topics itself. Thus, we may choose to believe that the variety of experiences that are being accumulated is providing a wide scope of opportunities to test elements of a methodology. Hence, the variety should offer the prospect that a methodology can be established which will be generally applicable and useful because significant reductions in the cost of public construction in developing countries may be achieved through its application.

What concept should be involved in establishing such a methodology? What considerations should govern in establishing the practicability of its application? What specific presumptions prevail which should be taken into account in the process of establishment? These are important questions to recognize in planning the first steps in the work. These questions are better answered in reverse order.

The first and the major presumption which prevails is that an intention exists in a host country to accept external assistance services in connection with efforts to achieve cost reductions in the public construction sector. Thus, the methodology in its details will presume that two mutually independent parties are to be involved in the application of the methodology; that is, an organization indigenous to the host country and a foreign technical assistance organization will cooperate toward reaching a common goal. The activities of these organizations will be guided by the methodology.

Another presumption is, although the process of achieving all the potentially significant cost reductions is a lengthy one, that some achievements are possible quickly without a protracted effort. Finally, a presumption prevails that the participation of the external assistance organization is to be temporary, having a duration only long enough to enable the host-country organization to continue effective efforts on its own momentum. Thus, it becomes clear that the primary orientation of the methodology will be more to guide the activities of the external assistance organization, such that its efforts can be of minimum duration, than it is to guide the activities of the host-country organization.

The next question concerns the practicability of applying the methodology. Assuring practicability requires that the constraints

imposed by institutions existing in the host country will be recognized when the methodology is established. Operational practices of existing host-country institutions affect, for example, the general quality and availability of high quality personnel to participate in the activities of the host-country organization. Also, they can set the level of authority given to the host-country organization. Consequently, the operational efficiency of accomplishing the work program and the acceptability of the results can be affected. More importantly in this respect, the practices of the institutions that would be engaged in the implementation of a cost-reduction opportunity and of the institutions in the sector affected by the implementation can influence the selection of problems to be solved in order to implement the final recommendations effectively. Thus, the practicability of applying a methodology should be directly related to a full awareness of constraints which can arise from the prejudices and the vested interests of existing institutions, as well as from their functional operations.

In the first question, the concept to be recognized in establishing a methodology involves making a clear distinction between the scope to be included under the mantle of methodology and the scope to be included under the mantle of technology. The boundary between the two is a fuzzy one, and this can lead to confusion in the work efforts, and also in the identification and evaluation of prospective elements of the final methodology. We found it necessary to make a specific delineation of this boundary in order to provide clear guidelines for our work.

In the process of examining the universe of construction situations offering prospects for the reduction of costs, the first step must be to isolate the set of situations which are real and possible to achieve. The tool to accomplish an isolation of real and possible

situations is a technological one. It concerns the examination of each prospective situation in terms of, for example, the pattern of material usage it incorporates and the identification of the technologically feasible ways in which the pattern can be altered to reduce the cost without reducing quality. The examination can also concern each prospective situation in terms of the manner in which labor and the services of capital equipment are combined and managed in order to identify the technologically feasible ways in which the manner can be altered to decrease cost without reducing quality.

Thus, the scope for technology is to provide the tool whereby cost reductions can be identified within a set of construction situations which are possible to achieve. But, such a tool does not provide for a time frame. Its use does not provide knowledge of how long it will take for a cost-reduction opportunity to be implemented so that the benefits can actually be gained. Nor does this use help to determine whether the changes necessary to implement a cost-reduction opportunity are even acceptable to the institutions affected. Therefore, having thus used the tool to identify a set of technologically-feasible cost reduction opportunities, the next step must be to assure the acceptability of the changes in practices involved in order to assure quick implementation and achievement of the benefits.

Another tool is needed to accomplish the next step, i.e., quick implementation. Such a tool is a methodological one. It will operate not only while the technological tool is being used to identify the feasible cost-reduction opportunities, but also during the subsequent stage when acceptance and adoption of the recommendations for action are sought and implementation is undertaken. Thus, the methodology tool is to be used in two ways. The first use concentrates on the formulation

of plans for action once the results of the application of the technological tool are known. The second use concentrates on securing acceptance and implementation of the plans of action. But, it should now be clear that the methodological tool will concern itself with the practices of host-country institutions as these affect both the identification of cost-reduction opportunities and their implementation.

The methodological tool will be applied to the operational practices of institutions in order to identify constraints which can impede identification and/or implementation efforts as well as freedoms which can accelerate them. The methodological tool will aim to seek a path through constraints and freedoms which enables quick identification and, equally important, quick implementation.

The distinction now made between technology and methodology illustrates the importance of defining terms precisely throughout the work, and the importance of observing these definitions rigorously. Thus so far in our work, we have found the need to adopt the definitions given in Appendix A.

Noteworthy among the definitions is the broadened definition of cost in terms of the three concepts of financial (or market) cost, of foreign exchange cost, and of national economic cost. The main reasons why a broadened definition of cost is necessary are: the importance placed in the three host-countries on the generation of employment opportunities as a result of the major emphasis given to construction of infrastructure (at least in Colombia and in the Philippines) in current national development efforts; and the shortage of foreign exchange in all three host countries. Reduction of costs in public construction in the national economic sense as well as in the financial sense therefore becomes a valid concept to include in our work.

III. THE COLOMBIA PHASE

Our experiences in Colombia so far have dealt with the establishment of the identification methodology to achieve reductions in the cost of public construction. The work was completed in September 1972. The experiences have already been reported (Interim Report to AID, October 1972).

Our efforts with respect to the development of an implementation methodology will be limited. A follow-up visit to Colombia is scheduled to occur during 31 October and 8 November 1973. The work program during this visit will be to learn at firsthand the details of implementation steps which the host-country government has taken over the course of the year since the completion of the work for the identification methodology.

In the meantime, we have learned through correspondence that a number of actions have occurred which may be classified as implementary in nature, and which may be inputs to establishing the beginnings of implementation methodology. These actions are listed chronologically in Table 1.

TABLE 1

CHRONOLOGY OF EVENTS SINCE THE CONCLUSION
OF THE COLOMBIA PHASE

1972

22 September	Letter from ADL (Bruce S. Old) to AID/Colombia (Jimmy O. Philpott) submits ADL qualifications in the field of urban development and housing. This responds to verbal request by Planeacion during final meeting of Colombia phase on 15 September.
- December	AID/Washington is following-up determining the interest of Planeacion in continuing work as last discussed during 15 September meeting.

1973

- January	ADL learns through private correspondence that the key Planeacion officer concerned with urban development and housing has left Planeacion Nacional and joined the Planning Department for the City of Bogota.
- February	ADL (Charles Bliss) reports in a letter news above to AID/Washington (Henry Arnold).
6 February	In a letter, AID/Colombia (James Kearney) forwards to AID/Washington (Henry Arnold) Planeacion's preliminary terms of reference on three topics, with explanation of delay as internal differences of opinion in the Planeacion organization regarding priorities for the candidate studies. The first two studies are an outgrowth of the ADL Colombia phase, and are the following: - Prefeasibility of the establishment of an information processing center for the construction industry. - Study of the transportation, distribution, and siting of production capacity for cement. The third study is new and concerns a study of multiple centers in intermediate cities.
14 February	Planeacion Nacional (Jorge Acevedo) forwards to ADL (Charles Bliss) copy of the final official report (in Spanish) of the Colombia phase, unrestricted in circulation numbered UINF-T-04, in two volumes, entitled "Oportunidades de Reduccion de Costos en Obras Publicas."
9 March	In a letter, AID/Washington (Henry Arnold) advises AID/Colombia (James Kearney) that funds for the first two studies could be provided for in FY '74 or FY '75 funds or alternatively the Mission could consider funding one of the three proposals out of the urban loan, for example. The request is made to convey this view to Planeacion Nacional.

IV. THE PHILIPPINE PHASE

The project activities in the Philippines were accomplished in two stages. The first stage, the reconnaissance, occurred between 27 June and 14 July 1972, and resulted in identifying tentatively the elements of the work program. Project completion was set for 15 March 1973. The second stage began on 13 November 1972 and continued until the actual completion of the project on 10 May 1973. The bulk of the project activity occurred during the second stage.

A. PROJECT ENVIRONMENT AND ACTIVITIES

The project was sited in the Bureau of Public Highways (BPH), a primary division of the Department of Public Works, Transportation and Communications (DPWTC). Accordingly, the focus of the work became the identification of opportunities to reduce the costs of the construction of roads and highways. The opportunities could concern the use of materials, the technological practices employed in construction, and the management by existing institutions of the different efforts involved.

The period of time during which the Philippine phase occurred fell inside a longer period of time during which the organization and the functions of the Bureau of Public Highways were themselves under study by a consortium group sponsored by the United Nations Development Program. We found that some of the activities of the consortium group could be classified as efforts toward cost reduction, and that we should take care that the work of our project will avoid overlap. The reorganization plan which resulted from the work of the consortium group was accepted in principle by the BPH, which undertook implementation

of selected recommendations about 1 March 1973. This implementation was still in progress at the conclusion of our project work on 10 May 1973. The effects of the implementation on personnel of the BPH, particularly with respect to the stability or permanence of their position, influenced the attitudes and performance of our counterparts during our own project work.

Policy guidance for the project was provided by a Steering Committee, whose Chairman was the Secretary of the DPWTC. The Secretary is a member of the Cabinet of the President of the Philippines. He appointed the members of the committee, and they were the following:

Baltazar Aquino, Commissioner, Bureau of Public Highways.
Desiderio Anolin, Director, Bureau of Public Works.
Alfredo L. Juino, Dean, College of Engineering, University of the Philippines and at the same time Administrator of the National Irrigation Authority.
Francisco Cacho, President, Philippine Contractors Association.

The position of the project leader (Bernardo L. Apostol), with whom ADL's project leader (Charles Bliss) worked, was originally that of Chief Engineer, but as the result of the reorganization, he became the Deputy Commissioner of Operations in the Bureau of Public Highways.

The Steering Committee formally met twice during the course of the project work. On 14 July 1972, Messrs. Apostol and Bliss orally presented the contents of the project statement, and on 10 May 1973, Mr. Apostol orally presented the results of the project and submitted copies of the final report. The members of the Steering Committee also

appeared and spoke officially at a conference/seminar, conducted as part of the project activities, at Quezon City during the period 26-28 March 1973.

The counterpart staff was organized as a task force led by the project leader, in which ADL personnel participated. The project was labeled as the Pilot-Technical Assistance Project (PTAP). The project office was located physically in a separated air-conditioned office space set aside in one of the buildings of the Bureau of Public Highways complex on Second Street in the port area of Manila. It comprised a single large furnished room. A project automobile and pickup truck were provided. The office operations were managed by a counterpart who was familiar with the Bureau of Public Highways administrative procedures and who could secure supplies, travel authorizations, and similar services. He had administrative control of the counterpart budget which was initially set at 35,000 pesos. We understand that this sum ultimately became inadequate and that an additional appropriation was requested. The key office-management counterpart staff comprised:

Castor C. Comes, until 28 March 1973
Encarnacion Gascon, from 29 March 1973
Pacita Gayya, secretary
Milagros Sugapong, clerk-typist

During the reconnaissance, the work topics initially selected for the project were the following:

- Cement procurement;
- Maximum service life policies for heavy equipment; and
- Labor utilization policy for programming new highway construction.

During the course of the work, the scope and orientations changed somewhat and a new topic was added, so that the final set of topics in the work program became:

- The Labor-Intensive Construction of Roads and Highways.
- Prolonging Equipment Service-Life.
- Improving the Distribution of Cement.
- Increasing the Utilization of Computers.

The counterpart personnel selected to take responsibility for the specific topics were:

Juanito Cutay, Labor-Intensive Construction
Antonio Garcia, Equipment Service-Life
Feliciano Bernales, Cement
Teodulo Kasala, Computers

In addition, support was provided through the counterpart services of Milogros Antonio as economist and statistician, and Cleofas Abajar, as a civil engineer. During the course of the work, ADL provided the services of support personnel from its resources for specific periods of time, as follows:

Charles Bliss, continuous residence, for all topics with specific focus on cement.
Carlo de Mattei, six weeks, Labor-Intensive Construction and Equipment Service-Life.
Edwin L. Field, three weeks, Computers.
Edward R. Squibb, one week, Equipment Service-Life.
John Reedy, three weeks, Project Economist.

Mary R. Hollnsteiner, six days, Consultant Sociologist on Labor-Intensive Construction.

Bruce S. Old, Senior Vice President, at final meeting.

The activities of the work program occurred in five stages, as follows:

1. By 15 November 1972, preparation of final version of the project statement.

2. By 2 March 1973, the completion of data-gathering and the host-country field work.

3. By 28 March 1973, the preparation and conducting of a conference/seminar.

4. By 18 April 1973, formulation of conclusions and recommendations.

5. By 9 May 1973, production of final report.

The final host-country report is entitled, "Achievement of Opportunities to Reduce Construction Costs in Public Highways," and is a publication of the Pilot Technical Assistance Project (PTAP) of the Bureau of Public Highways. Copies are available from the Office of the Deputy Commissioner of the Bureau of Public Highways, Second Street, Port Area, Manila, The Philippines. The report comprises two volumes: Volume I is the report proper; while Volume II contains the nine appendices referred to in Volume I. For the purpose of making reference, the BPH/PTAP report is labeled the "Host-Country Report."

B. IDENTIFICATION OF OPPORTUNITIES

The universe of possible opportunities for cost reduction in public construction was unilaterally narrowed to road and highway construction when the Government of the Philippines selected its Bureau of Public Highways to serve as the host organization for the project. This Bureau is one of the four bureaus of the Department of Public Works, Transportation and Communications, and is, obviously, responsible for the day-by-day activity in the construction and maintenance of the national road system as set out by Philippine law. The sister Bureau of Public Works concerns itself with non-highway construction.

1. Selection of Work Topics

The key source of authoritative information as to where national priorities lay in the construction of public roads and highways with respect to the identification of cost reduction opportunities was the Infrastructure Operations Center (IOC) in the Office of the President of the Philippines. This Center is located in Camp Aguinaldo in Quezon City.

The Philippine National Development Plan (1971-1975) provided indicative information basically on the projects to be accomplished during the plan period and their estimated financial costs. The National Economic Council (later NEDA - the National Economic Development Authority) provided in the course of the reconnaissance an awareness of the importance of employment generation from the activities of the plan. The BPH itself (i.e., the project director) offered no suggestions other than the one that the project results should be responsive to needs as foreseen by the IOC.

During the reconnaissance period, discussions between the counterpart and the ADL project directors with personnel of the IOC led to the selection of two topics, as follows:

- Cement Procurement. Specifically, the subject's importance stemmed from a Government/industry agreement whereby payments for a cement sales at a pre-agreed price to government construction projects were channeled to the Government-owned Development Bank of the Philippines, which has a large debt owed to it by the cement-manufacturing industry from loans the bank had made to help finance the construction of manufacturing plants. The prices set for such sales had become lower than prices set for private sales, and government cement supplies were becoming uncertain. Costs to complete on-going construction projects could rise, if lack of cement introduced delays in completion schedules. The objective of the work was to reduce costs of construction by avoiding rises in cost through assuring that cement supplies will be adequate. The means to achieve this objective was to determine the minimum rise in price the government should grant to the industry to assure adequate cement supplies. Because of government policy to install cement-concrete pavements in roads wherever warranted, the government is a major consumer of cement.

- Heavy Construction Equipment Service-Life. Five Philippine government agencies (including the BPH) are the owners of almost all of the large inventory of heavy construction equipment in the country, which has been purchased almost entirely with foreign exchange. The service-life experiences for this equipment lot have been poor, and a number of reasons for this

were suggested. The objective in selecting this topic was to reduce costs of construction through identifying changes in maintenance practices for heavy construction equipment which could extend service life.

During the reconnaissance period, we jointly selected with the PTAP counterpart a third topic on the basis of indications that attention should be paid to the pattern of labor utilization in construction, even though on the surface this topic did not seem to offer a potential for reducing costs in the conventional sense. The focus was to be on the selection of a typical road construction project for cost analysis and the establishment of guidelines for policy-making in order to promote labor utilization.

In the latter stages of the residence period, a fourth topic was selected as a spin-off from the cement topic. This was to increase the utilization by BPH personnel of computers as a means of managing large data-processing efforts which could be encountered in the course of implementing cost-reduction opportunities.

In the final form, the official titles of the four topics selected and the order of the importance they seemed to have at the time were as follows:

- Labor-intensive construction of roads and highways.
- Prolonging equipment service-life.
- Improving the distribution of cement.
- Increasing the utilization of computers.

2. Detection of Opportunities

The host-country report discusses the technological aspects of each topic, from which a set of technologically-feasible cost-reduction opportunities could be identified from the total universe of possibilities. We found, however, that in the detection process, the operations and the practices of the host-country institutions significantly affected the purpose of the work and the scope of the efforts as these were initially formulated for each topic, and consequently affected the nature of the technological information to be collected during the field work. Revisions became necessary. Thus:

- Cement. By the time the residence period started, the government/industry agreement on cement procurement for government projects had become obsolete. In fact, later in the residence period the policy direction and the operations of the Philippine cement-manufacturing industry were in effect taken over by the government by a presidential decree establishing the Cement Industry Authority (CIA), and the need to reconsider the price paid for cement to be used in government-funded projects disappeared. Simultaneously, as a result of questioning during field interviews, we detected a pattern of poor distribution of cement in particular areas of the country which led to high local delivered-costs. Thus, a significant change in the purpose and the scope of the topic became warranted, and we changed the emphasis to improving the distribution of cement from factory to markets. The intention in the original scope of work to compare the total present-and-future (global) costs of asphalt and cement concrete pavements was transferred to a new topic involving computer utilization, which is discussed below.

- Labor-Intensive Construction. The initial selection of this topic and the manner of its specification in the project statement were conceived as an attempt to provide some useful support to the government's interest in generating new employment opportunities from the construction activities foreseen in the national development plan. By the time the residence period began (actually beforehand, in October 1972), the DPWTC, as an action totally separated from our project (the Pilot Technical Assistance Project - PTAP), had established a departmental committee on labor-intensive construction methods which had just begun to function. This committee was concerned with a pilot project then under way to use labor-intensive methods to repair a section of a levee destroyed during the 1972 floods. The committee was slated to participate in a pilot road-construction (Capas to Botolan) project, in which a six-kilometer stretch was to be selected for construction by labor-intensive methods.

  We encouraged a close cooperation between the PTAP and the Departmental committee by participating in its meetings and by remaining flexible in our work details. Thus, the end product (as presented in the host-country report) became in effect an assessment of the current state of knowledge, experience, and attitudes in the Philippines on labor-intensive road construction methods and a presentation of details of a plan to apply this knowledge to a prototype project (the 100-kilimeter Marikina-Infanta road project).

- Computer Utilization. This topic was introduced late in the residence period. It had been noticed that the BPH possessed a small IBM-1440 electronic data processing system which was apparently little utilized in connection with engineering calculations. Also, we had detected a need for a rapid method of deciding between the use of a cement-concrete pavement or an asphalt pavement in new road construction or in major road maintenance projects, which might be fulfilled by a computer program.

- Equipment Service Life. The objectives and the scope for this topic changed the least of the topics initially selected. However, the PTAP found during its work that considerable opportunities which could be classified as cost reductions had already been detected in the subject area by the consortium (KAMPSAX of Denmark and Berger of the USA) engaged in the UNDP reorganization study of the BPH. Furthermore, implementation of some of its major equipment management recommendations had already begun (i.e., the two pilot regional mechanical-service depots at Bauang and at Cebu City). Accordingly, the best prospects for implementation seemed to be those offering action plans to improve the effectiveness of the operations of the regional mechanical-service depots in prolonging equipment service life.

The major lesson of the Philippine phase in regard to the detection of opportunities seems to be the importance of maintaining a flexible attitude, after the topics have been initially selected, toward the objectives and the scope of work so that these can be readily revised or reconsidered, or even new topics introduced, as the results

of field work indicate and justify. Within such a dynamic framework the detection of specific cost reduction opportunities can come from the current activities of existing institutions, and from observations made during the field work of needs whose fulfillment can reduce costs.

Above all, the Philippine lesson indicates the need to have an open mind to facts as they become obvious, and the need to have an uninhibited willingness to consider the implications of new facts in terms of their effects on prevailing terms of reference for the work of the project with respect to the detection of opportunities of cost reduction.

3. Evaluation of Opportunities

Early in the residence period, it became apparent that working within a line organization of the government (the BPH) coupled with being aware of a basis for forecasting the road construction workload on the BPH over a future period (the projects specified in the national development plan), together provided an opportunity for us to establish a yardstick for estimating the total impact of a specific cost reduction opportunity on the foreseeable construction activities of the BPH. The projection of future construction activities for the BPH became a major effort in the evaluation work during the residence period and the result appears in detail in the host-country report (Volume II-Appendix C). Thus, for example, it became possible to forecast the future cement consumption of the BPH through 1980 and the regional distribution of the demand. Any cost-reduction effect arising from an improvement in the distribution of cement could then be applied to total quantities that could be forecasted over a defined time period up to 1980.

On the other hand, the dynamic nature of the topics, the adoption of a broad concept of what meaningfully constitutes a cost reduction, the general effectiveness of the counterpart staff in the data collection and evaluation work, and the availability of data in actuality were factors which combined to make it impractical to achieve useful results by the original completion date of 15 March 1973 set for the project. Moreover, the complexity of evaluation for certain of the topics (e.g., the need to use shadow coefficients for costs, prices, and exchange rates in the estimation of national economic costs) indicated that a proper duration of the work could be unacceptably long in terms of bringing results to the attention of the Steering Committee quickly enough. We realized that we could not expect the Committee to sustain their interest and support the project over an excessive period of time.

An extension of the completion date to 10 May 1973 turned out to be adequate to provide results in the host-country report of a quantitative/qualitative mix of cost-reduction identifications suited to justifying the set of recommended action plans. These plans could then serve as the basic input to an implementation methodology. Accordingly, it became necessary for the action plans themselves to contain elements of data collection and evaluation activities for the further estimation of quantitative cost-reduction effects.

One lesson, applicable to the development of a methodology for identifying cost-reduction opportunities, then is that the length of time available to complete all of the steps in the identification methodology may not be long enough to permit evaluation of opportunities entirely in a quantitative sense, and some compromise may be necessary to introduce qualitative findings in the final results. The reason is

the need to take as a prime consideration, a choice for the duration of the project short enough to sustain interest at the policy-making level of government in the project by submitting meaningful results at an early date.

Specifically, the experience in the Philippines phase lead to a number of observations on the methodological aspects of evaluation as follows:

- Decision makers in the Bureau of Public Highways can be solely financial-cost conscious, with little or no appreciation of the economic (i.e., national economic cost) implications. Thus, funds to finance the Capas-Botolan pilot project of labor-intensive road construction were held up because of a belief that financial-cost estimates were excessively high when compared to the conventional capital-intensive technology for construction of roads. At the present time (in September 1973) it is not clear that this project has yet begun, although it had originally been scheduled for completion by June 1973.

- The capabilities of local personnel are limited with respect to the preparation of financial-cost estimates for construction operations involving conventional capital-intensive technologies. This deficiency lies in the lack of knowledge of the productivity achievable from machines in their different functions. With regard to the preparation of labor-productivity estimates, the basis for estimating costs is almost non-existent, although pre-World War II Philippine road construction was almost entirely done with only the use of labor.

- Little, or no, institutional facility exists for the generation or cross-fertilization of ideas across departmental or divisional lines of the BPH. The PTAP provided such an opportunity for a period of time. As examples: the PTAP identified submerged capability in several areas of the BPH in computer utilization; the broadly-oriented views of the PTAP seem to have had the blessing of the Department's Committee on Labor Intensive Methods; and PTAP ideas were disseminated across the different highway-engineer districts and regional offices of the BPH thorugh a series of one-day seminars held in a sample of ten of almost 100 BPH field offices.

- Rigid lines of responsibility, correspondingly-limited authority delegations, and burdensome administrative procedures within the BPH inhibit a relaxed and open-minded examination of situations needed to collect all relevant data and to evaluate them in an objective manner. The coincidence of our efforts with the reorganization efforts of the UNDP KAMPSAX/Berger consortium project stimulated our counterparts to have subjective attitudes in connection with their work in the evaluation of cost-reduction opportunities.

- Finally, the presence of a foreign group in the project (i.e., the ADL group) who were not subject to line responsibilities and authority delegations, but whose functions were recognized, allowed an opportunity for many impediments within the BPH to objective evaluation to be eliminated and for institutional impediments to acceptance and implementation to be detected and evaluated.

4. Design of Actions

The interview work to collect data and information during the residence period provided an adequate basis for the design of the specific action plans for each topic. The location of the project office within the main PBH facilities; the interactions with other BPH personnel both inside and outside the project; the cooperation through attending meetings of the Department's Committee on Labor Intensive Methods, including an awareness of the problems of implementing the projects in which they were involved; and the five-week period of field work throughout the country (Table D-2, Summary of Field Visits, Appendix B, Volume II of the Host-Country Report) established a confidence that realistic action plans could be devised. That is, these action plans could incorporate selected elements designed to overcome the institutional constraints we found from the field work. Hence, we could feel confident that the plans would be practical to implement.

The final attempt to determine the precise nature of the institutional constraints affecting methodology was made through the conducting of a conference/seminar in Quezon City during 26-28 March 1973 (pages B-4 to B-8, Appendix B, Volume II of the Host-Country Report).

During the period from the end of the conference through 18 April 1973, after which all attention was focussed on preparing the final report, the project team concentrated on preparing a comprehensive and detailed summary of the findings of the project through numerous internal team discussions of ways and means, which established tentative findings, conclusions, and action plans for the project. This draft summary was reviewed and approved by each project team member in

turn, in terms of their views on the feasibility of the technical content and the practicality of implementation in the administrative context of the BPH.

The action plans which resulted from this procedure are contained in the summary (Section I - Volume I of the Host-Country Report).

C. IMPLEMENTATION OF OPPORTUNITIES

The first step in the development of an implementation methodology was taken on 10 May 1973, and this was to convey the findings and the action plans to the Steering Committee, whose chairman could then, if he wished, refer any need for decision taking to the Presidential Cabinet. The written Host-Country Report was submitted, but in addition, the Project Team Leader orally presented the findings to the Steering Committee. At this point, the work of the PTAP to identify opportunities to reduce costs in road and highway construction was considered to be complete and the promises of the project statement fulfilled.

Our mission for AID contains only one formal function aimed at the development of an implementation methodology for the action plans resulting from the application of the identification methodology. This function is a provision for a two-week return visit to the Philippines, which can be spent either as a return after the lapse of a year (i.e., about May 1974) to learn the implementation events since the project completion, or, on Philippine government request as a return at any time before then to assist in the beginning implementation efforts.

To help assure implementation of the action plan for the most important topic, labor-intensive construction, we undertook in August 1973 an informal measured initiative step of our own. The basis for this step was our sense during the residence period of an inertia in the BPH toward taking initiative, perhaps because of the uncertainties introduced by the current reorganization of the BPH, or perhaps because of a then rather-limited delegation of authority from the commissioner level in the BPH.

We considered the action plan for the labor-intensive construction of the Marikina-Infanta Road as appropriate for the purpose of taking an initiative for the reasons that (a) labor-intensive road construction is a topic of highest importance to the Philippine Government, and (b) the appropriate technology concept it introduces is a subject of current worldwide interest for which an adequate quantitative base seems lacking.

By correspondence with the Chairman of the Steering Committee (the Secretary of the DPWTC) a three-element joint effort that comprised the dedication of the Marikina-Infanta Road as a prototype labor-intensive construction project, the provision of an effort for data collection and evaluation so that the results can be applied later elsewhere in the Philippines, and the provision of a similar effort so that the results could be applied later elsewhere in the world. We further suggested that the Philippine host country effort would focus on the first two elements, and that the ADL efforts could focus on the last two. We would try to find financial support for our own activities in such a joint effort.

The reply from the Chairman was enthusiastic and stated that the interest would be on road construction in the Bicol (Souther Luzon Island) region first with later applications to Mindinao. We are at this writing (October 1973) monitoring further developments.

D. PERFORMANCE OF COUNTERPARTS

The counterparts were selected solely by the administration of the Bureau of Public Highways. The Deputy Commissioner (the Project Leader) cooperated actively alone with the ADL project leader during the reconnaissance phase, during which time, the tentative project statement was established. When the residence period began, the entire staff had already been selected and were ready for duty. Later in the residence period, an additional counterpart was offered to the team, who took responsibility for the computer utilization topic when this was incorporated in the project. The office management and stenographic and clerical staff expanded itself at the end of the residence period at the time of the production of the final report, and also during the time of the conference seminar. As already noted, the position of the project leader within the BPH changed over the period of the project from Chief Engineer to Deputy Commissioner for Operations, because of reorganizational changes.

1. Motivation and Competence

The levels of motivation and competence in our counterparts varied from disappointingly low to unexpectedly high. These two characterizations did not necessarily follow in parallel for any individual. Our judgment of the professional members of the project

team in these respects, using a scale of 0 (non-existent) to 10 (top rating) is as presented below. We have allowed in the competence ratings for an evaluation of past experience of the individual in order to assess our expectation of his performance in the two categories.

	Motivation	Competence
Antonio Garcia	1	10
Juanito Cutay	4	8
Feliciano Bernales	5	5
Teodulo Kasala	9	8
Cleofas Abajar	9	7
Milagros Antonio	10	4

All of the team members received extra salary for their participation on the team. Some of the members, we were led to understand, were pressured into membership. In Garcia's case, he lost an opportunity temporarily for an overseas visit to Japan. This, plus the time demands of his extracurricular university-teaching career, seemed to have explained almost no motivation to participate in the work, although he clearly was the most competent of the entire team, as well as the most mature in judgment. His teaching schedule prevented him from participating in the field work, except for one school-holiday week when he traveled with us to Northern Luzon.

Cutay was affected by his feeling of an insecurity of his position in the reorganized BPH, but when proper assurances were made in this respect, his motivation level increased considerably. The rating shown for him is an average over the entire period.

Bernales exhibited almost no initiative in pursuing his subject but competently followed every lead given him. Kasala, a latecomer, was top-rated in terms of both characteristics, followed close behind by a more junior member, Abajar. Antonio was clearly highly motivated to a total dedication to the project, but suffered from a lack of experience and relevant education.

2. Attitudes and Performance

A concept which we have set forth as an ideal to follow in a methodology for identifying opportunities for cost reduction is for the external assistance organization (ADL) to avoid doing a task directly, but rather to guide the efforts of counterparts to do the work involved. The Philippine experience showed that appropriately high levels of motivation and competence on the part of the counterparts are required for such an ideal to be achieved. These levels were lower in the PTAP than, for example, in the Department's Committee on Labor Intensive Methods, who apparently were able to maintain a momentum in their work with only a part-time assistance from the International Labor Organization. In contrast to the experiences in Colombia, it is unlikely that the PTAP would have carried on effectively without a continuous ADL residence.

As the result, the project completion date was extended from 15 March 1973 to 10 May 1973. Also, in retrospect, the competence level probably forced a higher qualitative content to be incorporated in our results than we had originally foreseen. Conceptual guidance in the work was totally an ADL input.

An interesting facet arose during the field work, where ADL desired to stay in the background. The senior man, the captain, during these travels was Bernales, chosen by the team. He and the team prevailed on ADL to take a leading part in the discussions for the single reason

that the audience inherently would show more respect and attentiveness to the remarks of a foreigner, than they would to one of their own at about the same level of position. However, ADL was able to take a suitable background posture during the conference in Quezon City, where the team leader, the Deputy Commissioner, took a prominent role.

Total conceptual and organization guidance by us was a necessity during the report preparation. Vigorous discussion among the team developed the thoughts, but the leadership in the writing was ADL's with counterpart participation and approval of the content. English writing is apparently not thoroughly mastered in the northern Philippines by many people because of the predominance of the local language, Tagalog.

ADL suggested and vigorously argued for the topic leaders to participate in the oral presentation to the Steering Committee, but we were overruled on the basis that the counterparts at their level of responsibility would not be given the appropriate attention at the steering-committee level. In the executive session (no ADL presence) the team and team leader talked out the issue, and as the result, the team leader (the Deputy Commissioner) made the entire presentation orally. ADL had the opportunity however to make some closing remarks.

At one time during the residence period, ADL decided that, if progress were to be adequate to meet the revised completion date, we would have to depart from our guidance and advisory role and assume a direct line role as deputy to the project team leader. This became the ADL role during the final stages of the residence.

ADL support staff generally tried to follow the guidance role. Their participation in the work came during the residence period when it became clear that their work could be focussed on the evaluation of opportunities rather than on data gathering.

V. THE GHANA PHASE

The Ghana phase is currently in progress. The reconnaissance occurred during the period 29 May through 15 June 1973, and resulted in the formulation and issuance of a formal Project Statement on 4 July 1973. Project completion has been set for 31 March 1974.

A new element has been introduced in the Ghana phase, and this is the participation of ADL in the project on a non-residence basis. This has an advantage because a new parameter in the development of the identification methodology can be evaluated; but, on the other hand, responsiveness to local goals (namely, producing useful and practical results in terms of implementable cost-reduction opportunities) and adequate progress now becomes the primary responsibility of the local counterpart staff. To detect any problem affecting the completion of the work, we suggested a monthly report of progress in writing to be submitted by our counterparts and by ourselves. We submitted our first report on 31 August 1973, and have so far only received an acknowledgment from the counterpart organization dated 11 October 1973.

The counterpart organization is the Building and Road Research Institute (BRRI) of the Council for Scientific and Industrial Research (CSIR) in the Ministry of Finance and Economic Planning. Its director, Dr. J. W. S. de-Graft Johnson is the project leader.

The topics selected are the following:

- The Supply of Locally-Manufactured Construction Materials;
- Construction Alternatives for Building Roofs;

- Construction Alternatives for Road-Building Components;
- The Appropriate Use of Labor in Construction; and
- Improved Efficiency in the Construction-Industry Operations.

VI. THE WASHINGTON CONFERENCE/SEMINAR

The completion of the work in the three host countries and the follow-up visits to Colombia and the Philippines will be followed by a conference in Washington, organized to present the results of the project and to elicit comments and reactions from the participants. This feedback plus the follow-up visit to Ghana will provide the final inputs for the formualtion of the identification methodology we shall ultimately recommend and the elements of the implementation methodology we shall ultimately indicate.

The present schedule anticipates that this conference will be held in September/October 1974. The intention is for ADL to sponsor two counterparts from each of the three host countries as participants.

VII. THE CURRENT STATE OF THE METHODOLOGY

There are good reasons why an attempt should be made at this time, before the third host country work is complete and the results of the Washington conference known, to set down at least a tentative identification methodology for achieving cost reductions in the construction of public works in developing countries. Any attempt to set down the implementation methodology should await the follow-up visits to the three host countries, none of which has occurred at this writing.

One reason stems from the fact that the results of the project work so far provide some basis for postulating an identification methodology. Two other reasons are that having an evolving written model of the indicated methodology will enable more comprehensive results from the Ghana phase of the work to be obtained and the planning of the Washington conference/seminar to be more effective. A final reason is that a written model at this time will provide a basis on which different viewpoints on its merits can be exchanged in an unhurried manner.

A. FRAMEWORK OF OPERATION

The framework in which the identification methodology is to operate depends on one basic assumption, and this is that it is desirable for the host-country organization responsible for the completion of the cost-reduction project to have the benefit of inputs from a technical-assistance organization. In addition, the framework for the operation of the identification methodology includes the following elements:

- the methodology becomes applicable when an agreement in principle exists between the host country and the technical-assistance donor to undertake a construction-cost reduction project;

- the application is to be to the public-construction sector of a developing country economy;

- the application is to result in finding technically-feasible cost-reduction opportunities;

- the effects of the implementation of these opportunities will be a significant reduction in the cost of constructing public works; and

- the cost-reduction effects will reflect a recognition that both types of cost have been considered - national economic costs as well as financial costs - and that in some instances a reduction in one may correspond to an increase in the other.

- the application is to promote the involvement of counterpart personnel in the work to facilitate the continuation of the effort into the application of an implementation methodology.

The framework also depends on the two parties involved, the local organization in the host country and the organization selected by a technical-assistance donor to support the efforts of the host-country organization, agreeing to the use of a common terminology to guide their joint efforts. The terminology which has evolved so far in the work is presented in Appendix A.

Finally, the framework depends on both organizations recognizing that the conditions prevailing in the host country at the time the identification methodology is to be applied will generate a set of constraints on the freedom of action to achieve the desired identification. So far, constraints have been generated as soon as the host country counterpart organization is chosen and the nature of its activities is known, when the host country itself possesses a set of current local national goals or aspirations either formalized as a national plan or otherwise, and when the limitations of the counterparts' capabilities have become clear. The accommodation of these constraints will largely determine the nature of the activities and the character of the results.

1. Choice of Host-Country Organization

The three host-country organizations are characterized in Table 2. They were unilaterally selected by the host-country governments. In the Colombia phase, the functions of Planeacion required that effort be dispersed over a broad scope of interests. This dispersal, the time limitation, and the staff available permitted investigation in depth of only one topic (i.e., the cement industry). In the Philippines phase, however, the narrower scope of the functions of the Bureau of Public Highways allowed a deeper focus of interests, and all four topics were explored in an apparently adequate depth. For the Ghana phase, it is yet too early to make any observations, except perhaps the preliminary one that the research nature of the counterpart organization may lead to a de-emphasis of any need to observe completion schedules.

TABLE 2

THE CHARACTER OF THE THREE HOST-COUNTRY ORGANIZATIONS

Country	Name	Function	Scope
Colombia	Departamento Nacional de Planeacion (Bogota)	Staff Planning Group for the Executive Branch of the Government.	All governmental areas of professional activity.
Philippines	Bureau of Public Highways (Manila)	A Division of the Department of Public Works, Transportation and Communications, responsible for the construction and maintenance of national roads and highways.	Line responsibility for the implementation of approved road and highway construction projects.
Ghana	Building and Road Research Institute (Kumasi)	A unit of the Council for Scientific and Industrial Research, which is in the Ministry of Finance and Economic Planning.	Technical research of knowledge in the construction of roads and buildings.

The ideal and first choice of a host-country organization seems so far to be that of forming a task force of interagency counterpart personnel, whose overall composition and personal experiences can be considered to fit the work topics selected. Therefore, when the agreement to undertake a construction cost-reduction project is reached, the identification of the counterpart organization should be deferred, if possible, until the work topics have been selected. The selection of topics should first be made through the appointment of an ad-hoc group, or even through efforts with a high-level knowledgeable counterpart who is conversant with current national goals and aspirations and with the public-construction sector.

The reasons supporting such a choice as the ideal and the desirable one are the following:

- the work group can be freed from the institutional prejudices of a line organization, whether prejudices exist because of the conventional mode of operation of the line organization or because of the prevailing opinions of authoritative individuals within the line organization;

- the status and the reporting mission given to a special task-force group should earn more high-level attention for its findings and recommendations than from a staff grouping within a line organization; and

- counterparts may feel their professional careers are not harmed but rather honored by secondment for a period of time to such a group outside their own organization as much as they might be harmed by secondment to a staff grouping within their own organization.

Unless the host government assigns a high priority to a cost-reduction project, the idea of an interagency task force is probably impractical because of the problem of securing the services of qualified personnel and the availability of these services full-time for an extended period.

The next most desirable alternative seems at this moment to be the establishment of a task force within a line organization, such as occurred during the Philippine Phase (i.e., the establishment of the Pilot Technical Assistance Project within the Bureau of Public Highways). In this event, it becomes important to identify a steering group for the project which should be made up of interests of scope above and beyond the leadership of the counterpart organization. In this way one can avoid prevailing institutional or individual prejudices. The current interest in the Philippines already noted of the Chairman of the Steering Committee (the Secretary of Public Works, Transportation and Communications) in securing implementation of one topic may support this point.

2. Selection of Topics

The selection process should be a joint effort, but the process should be based on the constraint of choosing from among all the topics that may be identified by the host-country organization as bearing upon national priorities and/or local aspirations.

National priorities are, of course, usually expressed through the formulation and implementation of a national development plan. This was the situation in Colombia and in the Philippines, although not in Ghana. In Colombia, the day-by-day activities of Planeacion were almost entirely focussed on responding to the goals of the National Development Plan, which had been issued during the early stages of the Colombia

phase and securing their cooperation for the project depended on choosing topics bearing on the Plan. In the Philippines, the National Plan emphasized road and highway construction and this reflected in a high activity level in the Bureau of Public Highways and a desire to look for cost reduction prospects which related to the BPH road construction program. In Ghana, the priorities were not formalized, but seemed to be well known.

3. Selection of Counterparts

Ideally, the selection process should be a joint effort between the host-country organization and the technical-assistance organization during which the host-country organization would establish a roster of interested candidates and the technical-assistance organization would interview the candidates to establish education and experience qualifications, to match availability of an individual and the work program, and to assess motivation and attitude. It would then rank the candidates on the basis of the findings. Finally, the host-country organization would make the choice.

In the experience so far, counterparts were selected in advance almost entirely by the host-country organization, although in Colombia the technical-assistance resident (ADL) during the course of the work was able to identify new counterparts and to secure their services for the project.

B. RECONNAISSANCE VISIT

The first formal joint activity between the host-country organization and the technical-assistance organization will be the reconnaissance visit to the host country by the latter. This visit should have four distinct purposes; namely,

- to characterize the framework in which the methodology is to be applied;

- within the framework, to prepare a Project Statement in which the topics have been selected and specified, the work program outlined, and the participating host-country organizations identified;

- to identify and secure the participation of counterparts, and to assure that they have begun to work in accordance with the details of the work program; and

- to identify a Project Steering Committee, and meet with them for the first time in order to secure their approval of the Project Statement.

In Colombia, the reconnaissance visit (one-week duration) occurred considerably before any effort to establish a project statement was undertaken. In the Philippines and in Ghana, the reconnaissance visits (three-weeks each) accomplished the first two and the last of the four purposes. From the experience so far, it appears that the length of the reconnaissance visit should range from six to eight weeks, depending on the country, and that the visit should terminate not before the full counterpart staff has been recruited and it appears that the initial stages of the work program are underway.

Taking a recess at this point for a substantial period of time, perhaps two or three months depending on the country and on the momentum given the project during the reconnaissance, can have certain advantages which are the following:

- an opportunity is presented during which the performance and progress of the counterparts can be evaluated;

- the part of the work program which needs to be performed outside the host country may be undertaken;

- the cost of the participation of the assisting organization may be reduced.

1. Preparation of the Project Statement

The contents of a typical project statement are illustrated in Table 3. Three project statements have been prepared so far, one in each country; and the statement for Ghana is perhaps the most developed in format.

The details of the Project Statement should be compiled so that the statement may be considered a public document to be freely and widely distributed. This document should be issued under the name of the host-country organization. The Colombian and Philippine project statements are contained as appendices to the host-country reports for those countries.

The following are general guidelines for the definition of the objectives, scopes, and methods of approach for the topics selected:

- The focus should be primarily on materials and construction technology, with secondary attention paid to the institutional practices that could affect the acceptance of the results. The problems may focus on planning specifications, standards, procedures, testing, inspection, and similar activities.

TABLE 3

CONTENTS OF A TYPICAL PROJECT STATEMENT

1.0 Introduction

1.1 Background of the project: The mutual interests which brought it about; the importance of the project to the host country; the functions for the project statement.

1.2 Basic procedure: Its short-term nature, and its context for the longer term; the plan for a steering committee; and the scheduled date for completion.

2.0 Objectives and Scope

The specific objectives in the context of the host-country conditions, and the scope of the work in terms of the specific topics which have been selected.

3.0 Work Programs

A list of the programs containing for each: background supporting the choice of the program; the objectives for the program to be achieved in the work; the elements of the work plan; and the forecast of the final product.

4.0 Methodology

General policy statements covering the method to collecting and evaluating data and information relevant to the work programs such as level of detail, sources of information, use of a conference or seminar, and the specific steps or stages in the project.

5.0 Responsibility and Participation

Who is the responsible organization, who is the technical assistance organization, and which organizations in the host country are potentially available to participate in selected areas on a part of full time basis.

Appendices:

This is a flexible component of the project statement and should record information detail already known and which may be useful in the work. Appendices to the three Project Statements have contained: Summary of National Development Plan (Colombia); Public Works Construction and Costs in the Development Plan (Philippines); Concepts of Cost Reduction (Ghana); Demand and Supply for Housing (Ghana); Aspects of Achieving Results (Ghana).

- The problems should be sharply defined so that solutions may be found within the time period allotted to the work, but at the same time they should be sufficiently broad to permit significant results to be obtained.

- The existence of a large data base that can readily be compiled into a useful form should be an important factor in the selection.

- The technical assisting organization should be foreseen as a backstop, i.e., a resource to maintain progress should any detail of the work program generate problems beyond the competences of the counterparts, and to provide specialist personnel who can participate in selected well-defined areas of the work requiring deep penetration of detail.

- The technical assisting organization should give maximum attention to encouraging the counterparts to take the initiatives needed to complete the work within the schedule. It should undertake initiative actions only when a major delay in the completion of the project becomes apparent.

2. Recruitment of Counterpart Staff

The project leader should be identified from a level in the host government at least high enough to give him some freedom in day-to-day actions and in minor policy making which is related to the work. Major policy making for the project details should come from the Steering Committee. The project-leader experiences so far have been the following:

Colombia: Chief of the Unit of Infrastructure, reporting directly to the Chief of the National Planning Department.

Philippines: Deputy Commissioner of the Bureau of Public Highways in the Department of Public Works, Transportation and Communication, reporting directly to the Commissioner of the Bureau.

Ghana: Director of the Building and Road Research Institute, reporting directly to the Chairman of the Council for Scientific and Industrial Research in the Ministry of Finance and Economic Planning.

We consider these project-leader experiences have so far to have been successful. A useful guide is to look for candidates at levels in government such as are illustrated above.

The number of counterparts recruited for the project team will depend on the work program. As a minimum, the technical assistance organization should participate by evaluating and ranking candidates, as noted above, to lead (man-in-charge) and take responsibility for each topic. Recruitment of other counterparts may then be left to each topic leader as he sees fit during the course of the work.

An office staff should be recruited. The requirements will vary and should be established on an ad-hoc basis. In Colombia, the National Planning Department hired a competent secretary for the duration of the project. In the Philippines, the Bureau of Public Highways assigned

a competent office manager and replaced him when he retired from the civil service while the project was still in progress. The Bureau also provided two full-time secretaries, and additional clerical and secretarial personnel as the work load demanded (particularly at the time the final report was prepared). In Ghana only the reconnaissance has been completed so far, and the Council for Scientific and Industrial Research provided the full-time services of a competent secretary during the period.

3. Identification of a Steering Committee

The major importance of a steering committee lies in the prospect that its existence could serve later as a strong stimulus to implement the results. Also important is the knowledge during the project that a group of higher-level government (and possibly including also private-sector people) have knowledge of the project topics and approve of the selection. Finally, the existence of a steering committee provides an opportunity for making a formal presentation of the final report in a manner which can be designed to stimulate implementation of the results through facilitating their quick comprehension.

In Colombia, although we made attempts to have a steering committee established, nothing in this respect developed. Instead, the results of the work were orally presented to the Chief of the National Planning Department, in which organization the project was located. In the Philippines, a formal steering committee was established, whose membership was diverse, a mixture of government (Department of Public Works, Transportation and Communication), university, and private sector

representatives. A steering committee is planned for the Ghana phase, but its membership is not yet clear. The Philippine experience seems to have indicated a workable pattern for obtaining a steering committee for a project.

4. Office Facilities

Adequate and separate office facilities are vital, if work is to be effective and communication adequate. These existed in the early stages of the Colombia phase (the CINVA offices in the National University in Bogota), but were not available during the later stages, when camping in temporarily unused offices was required. Adequate, although austere, office space existed throughout the Philippine phase within the Bureau of Public Highways main offices. No pattern has been established so far in Ghana.

C. IDENTIFICATION METHODOLOGY

At this stage, the topics will have been selected and the project staff recruited. The main thrust of the work will then become the identification of technically-feasible opportunities to reduce construction costs, and to formulate plans of action which are feasible to implement in the framework of the practices of existing institutions. As already mentioned, the use of technology is the means whereby feasible opportunities for cost reduction can be identified, while the use of the methodology such as is now being presented is the means whereby the opportunities can be readily and quickly implementable.

1. Detection of Opportunities

Detection is essentially a technological process. The detection process considers four methods whereby a technology currently employed to accomplish any given task may be improved, or changed, in order to reduce the cost. These methods are

- increase the productivity of the current technology by eliminating lost time and motion of the labor and capital resources, and/or by eliminating waste in the use of materials.

- without changing the mix of labor and capital in the technology, increase the productivity of the labor component by increasing the motivation of the personnel such as by changing the allocation of tasks among the personnel, changing the number of personnel under a supervisory unit, or promoting incentive through an alternative method of payment.

- again without changing the labor/capital mix, increase the productivity of the capital component by substituting one capital unit by an alternative more-productive capital unit; and

- devise an alternative mix of labor and capital, i.e., an alternative technology, capable of accomplishing the identical task at a reduced cost.

In order to enable the four methods for detecting opportunities to be utilized effectively, comprehensive data and information need to be

compiled as far as this may be practical within the time schedule for the project and the personnel assigned to it. Four major areas for data and information compilation exist, and these are:

Materials. The major areas for data collection are:

- identification of the predominant materials of construction and their current pattern of usage. The usual construction materials are: cement; structural burned-clay products; aggregates; structural and reinforcing steel; asphalt; and wood;

- the current state of research in government, academic, and private organizations into the aspects of improvement of properties and adaption to new uses through analysis, testing and innovation;

- the current emphasis on value engineering (i.e., seeking the proper balance between long-term and short-term costs) in the specific usages of alternative materials;

- the potential to use indigenous sources of construction materials that may not have yet been developed;

- the degree to which formalized material specifications have been standardized and the appropriateness of the standards employed; and

- the extent to which foreign exchange is required to permit the current usage pattern of construction materials.

Construction Technology. The areas in this category are:

- the appropriateness of the construction technology employed, as this may be defined by the balance between the use of capital and the use of labor in the technology;

- the appropriateness of the construction technology employed, as this may be defined by the balance between the first cost and the later maintenance cost (or the balance between the short-term and long-term costs) that is represented in the technology;

- the appropriateness of the construction technology employed, as this may be defined by the ease of supervision of the construction activities such that the quality of the completed installations agrees with the quality planned for in the design;

- the effectiveness of the utilization of capital-intensive equipment in the construction practices; and

- the effectiveness of the utilization of labor in the construction practices.

Public Construction Institutions. The areas in this category are:

- the definitive description of the individual activities in the procedures followed by government organizations and private construction contractors between the time a construction project is conceived and time that it is completed and handed over for use;

- a description of the physical facilities available that could be useful when change involves technological research and development; and

- an assessment of the problems involved in introducing changes into the procedures followed and with the physical facilities available.

Economic Data. This category concerns the collection of qualitative data and quantitative statistics which can serve as a basis for estimating the shadow coefficients of the prevailing costs of labor of various skills, foreign exchange, transportation, and interest, as examples.

2. Evaluation of Opportunities

Evaluation is also essentially a technological process. It is technological because the evaluator concentrates only on objectively observable data, or on estimates of data that are not fully observable; thus, he avoids making value judgments which would carry evaluation into the non-technological arena.

Evaluation of data should be attempted early in the data collection stage because such attempts can detect needs for particular data not previously foreseen, or they can identify investigation routes promising more significant results than those previously foreseen. The evaluation process will comprise essentially the estimation and comparison of costs, whenever sufficient data are available, between the prevailing technology of accomplishing a construction task and

an alternative technology which becomes evident. When the preparation of cost estimates is not practical, the result of the work may be a definition of the justification to pursue the data further as part of the implementation of an action plan.

The preparation of cost estimates should be undertaken to determine the cost effects of an alternative technology capable of accomplishing the given task with equal performance of the finished installation as that of the current technology, in terms of financial (or market) costs and of national economic costs. From the financial-cost results, it is practical to establish the effect of the adoption of the technology on the operations of the institutions which are financial-cost oriented. Also, it becomes possible, through the analysis of national cost, to establish the effect on national income.

From a national standpoint it is appropriate to concentrate on national cost reduction, i.e., upon the enlargement of real national income rather than on financial-cost reduction. Thus, national economic cost effects are deemed to override financial-cost effects as a criterion of the appropriateness of a technological alternative.

National economic costs may not be the only criterion, from a national economic standpoint, for the choice of alternative technology, There can be a desire to give weight to employment and foreign exchange effects. Thus, in anticipation of the value judgments that national decision makers may wish to exercise, it is advisable to analyze alternative technologies not only in terms of effects on national economic costs, but also in terms of impact on employment and foreign exchange. However, our assumption is that, in general, the only technological alternatives being sought are those which promise to reduce, or at least not to increase, national economic costs.

Another factor in the evaluation is the effect of an alternative technology on the time profile, including the total time for the completion of the task. For this purpose, all costs, whether financial or national economic, need to be discounted back to the beginning of the task, at a pre-selected rate, in order to make possible cost comparisons of alternative technologies.

3. Design of Actions

The design of actions is a largely methodological process dealing with the impediments to implementation generated by the prevailing practices of the institutions involved in the public construction process. The importance of designing plans of action appropriate to these practices lies in the fact that the results of the work will be useful only if they are implemented, i.e., only if the recommendations for changes in the pattern of materials utilization changes; in the methods for selecting and applying construction technology; and in changes in the functions and operations of the institution involved in the public-construction process are actually put into effect.

The basic inputs to the design of plans of action are the results of the evaluation work to identify cost reduction opportunities obtained through observing two criteria:

- Technological Feasibility. Attention will have been put on materials and how they are being used (with emphasis on materials of indigenous origin) and on construction technology and how it is being applied.

- Methodological Feasibility. Attention will have been put on the existing institutions, their prevailing practices, and how they manage the applications of technology in construction. In this respect, a distinction will have been made between the constraint institutional practices on one hand put on the freedom to change from currently used technologies to alternative technologies promising reductions in the broad concept of cost, and on the other hand the constraints which affect the speed with which potential reductions in costs of construction can be accepted and implemented. The latter element in this distinction is the important input in the design of actions.

Thus, the significant factor to be reckoned with becomes the practicality of implementation of action plans within a framework of the current practices of the public and private organizations involved in public construction. Such organizations hold individually well-defined viewpoints consistent with their individual goals, and they may not necessarily accept the findings of an essentially technological effort.

The approach to reconcile such differences should be to provide a forum in which the differences can be aired and evaluated by discussion and argumentation. A secondary set of project results would thereby be generated as a "feedback" for amending the primary results of the essentially technological effort in a manner which can assure quick implementation. The key element in the design of actions should be to organize a broadly-attended conference-seminar, which will have the following character:

- the invitation list should include all shades of informed opinion relevant to the topics in the work program, and the individuals should be selected from public and private organizations;

- the invitees should be provided beforehand with a set of papers reporting the details of the findings from the work program.

  The purposes here are to provide background and a foundation upon which discussion and argumentation will be effective and efficient in generating needed feedback;

- the evaluations which result from the completion of the work program should be prepared beforehand and presented publicly for the first time at the conference, incorporated perhaps in the set of papers noted above;

- a sufficient number of objective "listerners" should attend the conference to cover all the activities, and then be able to identify and evaluate the feedback information in the detail needed to correct the action plans; and

- the conference organization may provide for subdividing the conferees into groups according to the individual topics to be covered, and to the need to avoid mixing divergent and unrelated interests in the discussions.

After the completion of the conference activity, the set of action plans which are to be recommended in the final report for implementation should be formulated by the project team, and reviewed by each topic

leader from the view of judging the acceptability of his plan for submission to the Steering Committee and the implementability of the individual elements in each plan.

In general, the experiences so far indicate that an action plan will have the following elements:

- the specification of a set of activities which clearly have implication for achievement in the short-term;
- the specification of a second set of activities which clearly have implications for achievement in a longer term, but clearly identified with a construction project whose inception date can be foreseen;
- a specification of the organization and its character that should be established to take responsibility for satisfactory accomplishment of the activities specified;
- a specification of the authority that as a minimum should be delegated to the organization; and
- a specification of the immediate task which the organization should undertake upon its creation, selected to produce quick (although perhaps minor) results with the primary purpose of overcoming initial inertia.

The elements specified above will probably apply where action plans cover a topic of major importance and of wide scope. Some of these elements may not necessarily exist for topics of importance but of lesser scope.

D. IMPLEMENTATION

The cost reduction opportunities identified and the details for the plans of action to achieve them are the final products of the identification methodology. The primary focus of our work in the three host countries will have been to establish the identification methodology to yield these products. Another focus of our work is to begin the development of an implementation methodology, and we have concentrated on two elements of work in this respect.

1. Presentation of Results

The primary opportunity to put over and gain acceptance for the results of an identification methodology is an oral presentation for the Steering Committee. Organizing such a presentation should provide for an easy comprehension of the action plans, and the oral content should de-emphasize justification and detailed background. If this presentation is brief and effective, adequate time will have been allowed for questioning and discussion, and the members of the Steering Committee should have had minimum difficulty in absorbing the results of the project and formulating their viewpoints for implementation steps.

The written final report should be formally submitted at the time of the oral presentation, and this ceremony will mark the formal conclusion of the first stage of the cost-reduction project. The form of the second stage will depend on the recommendations regarding the on-going organization in the action plans.

The procedure just described was followed in the Philippines. In Colombia an oral presentation was made before the final report was available, but after the elements of the action plans had been identified. For Ghana, the plan is to follow the Philippine procedure.

So far, in Colombia and in the Philippines, the final report has been organized to encompass all the topics selected. This procedure should be followed, but at the same time it should be recognized that implementation may require breaking out individual topics in a written format suited to the implementation steps. The final report should contain a concise summary of the findings and conclusions and a comprehensive but also concise presentation of the action plans.

2. Follow-up

The only provision in the scope of our work that deals with the implementation methodology concerns a follow-up visit to each of the three host-countries about one year after the completion of the work of identifying opportunities. The objective is to learn the events regarding implementation that occurred during the period since completion; and then to analyze the meaning of these events in terms of detecting possible improvements in the methodology for identifying cost-reduction opportunities.

In addition, as reported above, we have taken a number of actions by correspondence in Colombia and in the Philippines, designed to assure implementation and to assist the development of an implementation methodology. It is too early at this time to make any observations in this respect.

APPENDIX A

TERMINOLOGY

APPENDIX A
TERMINOLOGY

The usefulness and ease of application of the methodology will be enhanced, if certain concepts which might be viewed differently by different readers are precisely defined. The following definitions appear to be pertinent. Additions or subtractions may be made as warranted by further work in the development of the methodology.

Public Construction. The construction of any civil engineering work which is financed, either directly or indirectly, through governmental funds or guarantees of credits.

Financial Cost. This may also be termed "market" cost. These are costs as seen from the point of view of the investor or financier of a construction project. Such costs are computed using market prices and include taxes paid, interest payments, and depreciation, as well as items like wages and materials.

National Economic Cost. These are the costs as seen from the point of view of the nation which is committing its resources in order to construct useful civil engineering works. Such costs are regarded as the production values that are forgone as the resources allocated to a construction project are withdrawn from other productive activities. The resources include labor, land, materials, capital equipment, etc., and the national assets are calculated using "shadow" prices, i.e., those which indicate more accurately than do market prices the supply and demand situation for each resource. Taxes are recognized as transfers - not as national costs.

Foreign Exchange Cost. These are the costs which arise when specific materials, labor, or services are not available within the country and must be secured abroad through payment in a foreign currency. The effects of any particular technology on foreign exchange reserves are separate from, and may be different from, financial cost and national economic cost effects.

Appropriate Technology. A technology is a unique combination of resources, such as labor, materials and fuels, and equipment which is capable of accomplishing a given task. The resources involved in a technology in any given on-site situation may be classified as a labor resource or a capital resource; and alternative technologies, each alternative capable of accomplishing the same task equally effectively, may differ in the proportion of the labor and capital resources consumed. If more than one technology can be considered to accomplish a given task, then a choice is needed that is appropriate to the resource position at the location of the task, or in other words, appropriate to the economy of the location affected by the accomplishment of the task. Accordingly, the appropriate technology for accomplishing a given task is defined as the one that minimizes the national economic cost, except as this criterion is modified by national decision makers to accommodate effects on employment and foreign exchange.

APPENDIX B

BIBLIOGRAPHY

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : SEE DISTRIBUTION BELOW

DATE: November 15, 1973

FROM : TA/OST: Merril Lonitz

SUBJECT: ADL Report

Your assistance is solicited by OST in reviewing the attached interim report. This report was prepared by the A.D. Little Company in connection with their contract on Reducing Costs and Improving Performance in Construction of Public Works. The interim report is now being circulated for review and comment prior to the preparation of the final report. Your assistance in reviewing this document will aid in making the final product more useful. A final report, which will incorporate comments based on these reviews along with the final results of the ADL study, will be prepared next spring.

In order that comments might be considered by ADL in the preparation of the final report, it is suggested that they be returned to this office by January 15, 1974. Preliminary comments will be passed to Mr. Charles Bliss of ADL during a meeting tentatively scheduled for late this month.

Attachment: a/s

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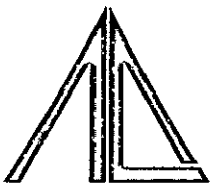

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